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Hansen

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(54) **INTEGRATED MANIFOLD SYSTEM**

(71) Applicant: **Special Projects Operations, Inc.**, Belcamp, MD (US)

(72) Inventor: **Brennan E. Hansen**, Chesapeake, VA (US)

(73) Assignee: **Special Projects Operations, Inc.**, Belcamp, MD (US)

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(Continued)

(51) **Int. Cl.**

A62B 9/04	(2006.01)
A62B 9/02	(2006.01)
A62B 7/02	(2006.01)
B63C 11/22	(2006.01)
F17C 13/04	(2006.01)

(52) **U.S. Cl.**

CPC ***A62B 9/04*** (2013.01); ***A62B 7/02*** (2013.01); ***A62B 9/02*** (2013.01); ***B63C 11/2209*** (2013.01); ***F17C 13/04*** (2013.01); *F17C 2205/0146* (2013.01); *F17C 2205/0338* (2013.01); *F17C 2270/025* (2013.01)

(58) **Field of Classification Search**

CPC A62B 9/04; A62B 9/02; A62B 7/04; A62B 7/02; A62B 7/00; A62B 9/00; B63C 11/2209; B63C 11/02; B63C 2011/2218; B63C 11/2227; B63C 11/2236; B63C 11/22; F16L 41/03; A61M 16/20; F17C 2270/025; F17C 2205/0146; F17C 2205/0338; F17C 13/04

See application file for complete search history.

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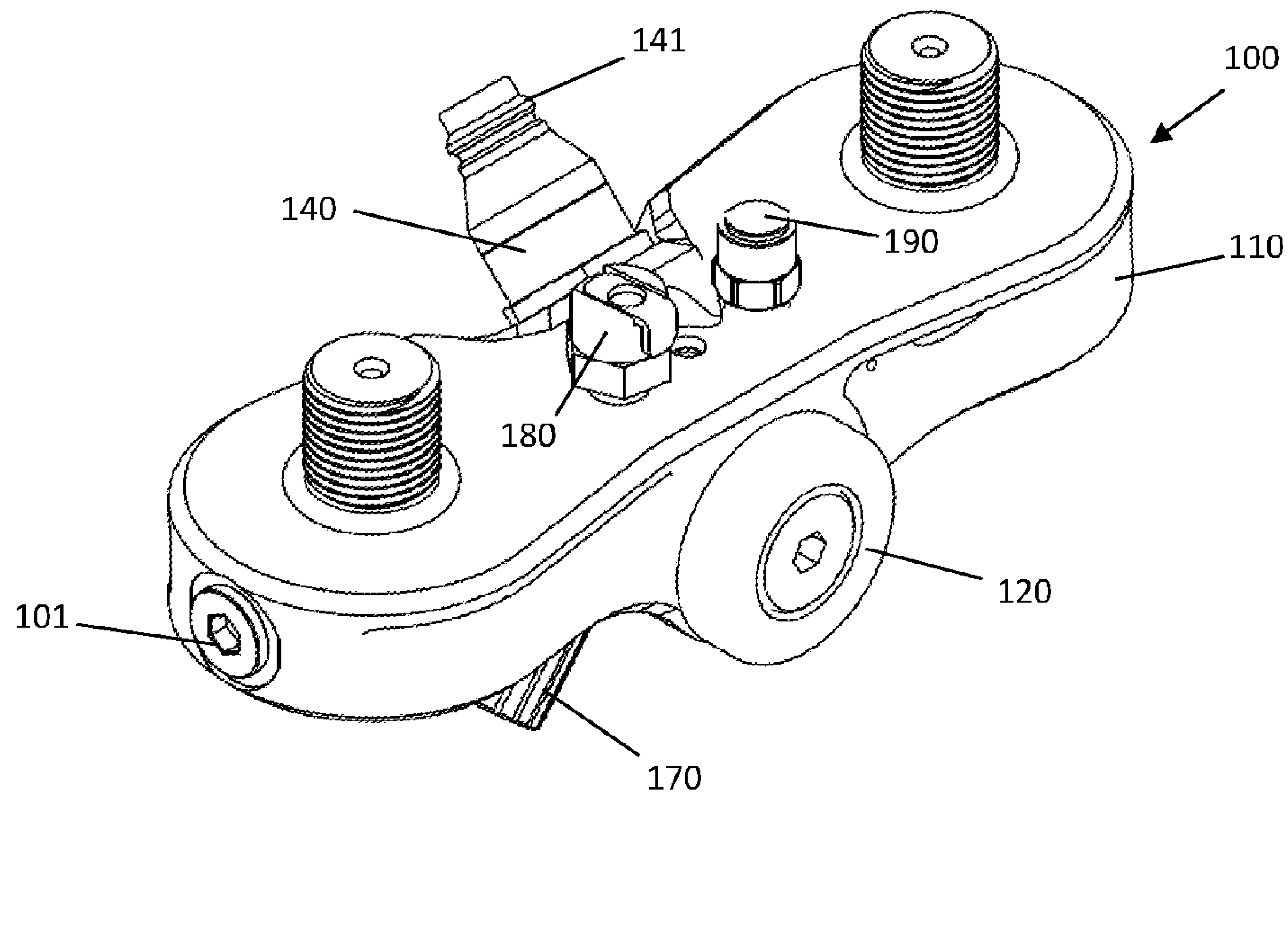
Primary Examiner — Tu A Vo

(74) *Attorney, Agent, or Firm* — Whiteford, Taylor & Preston, LLP; Gregory M. Stone

(57) **ABSTRACT**

An integrated manifold system combines in a single, compact, unitary assembly a one-piece, machined manifold for connecting air supply cylinders with a first stage regulator and recharge port. The manifold body has at least one bottle port configured to removably receive a bottle of pressurized air, a first stage regulator chamber, a quick disconnect fitting port, an air channel in fluid communication with the at least one bottle port and the first stage regulator chamber, and an outlet channel in fluid communication with the first stage regulator chamber.

24 Claims, 7 Drawing Sheets



Related U.S. Application Data

(60) Provisional application No. 62/563,714, filed on Sep. 27, 2017.

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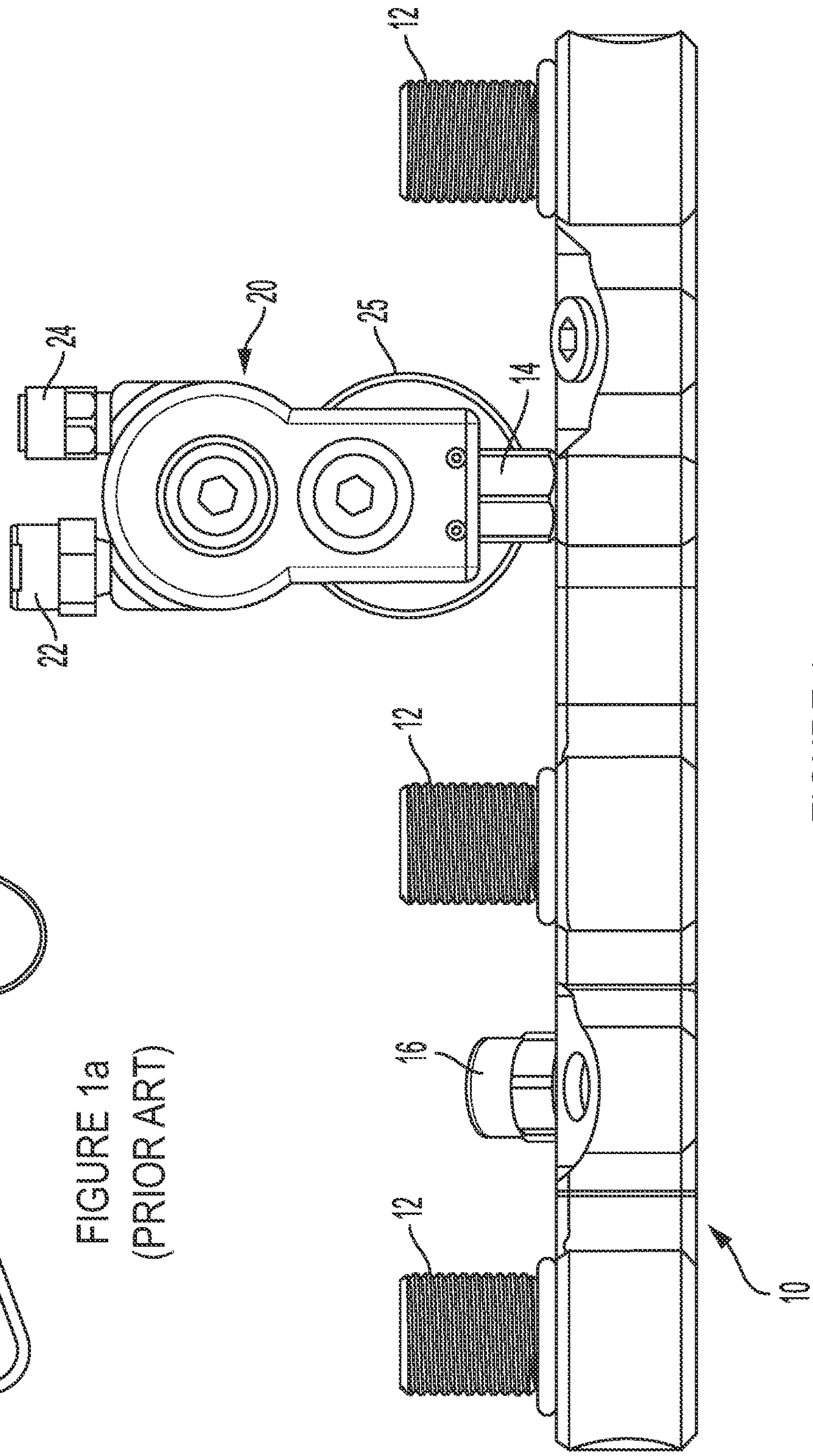

FIGURE 1
(PRIOR ART)

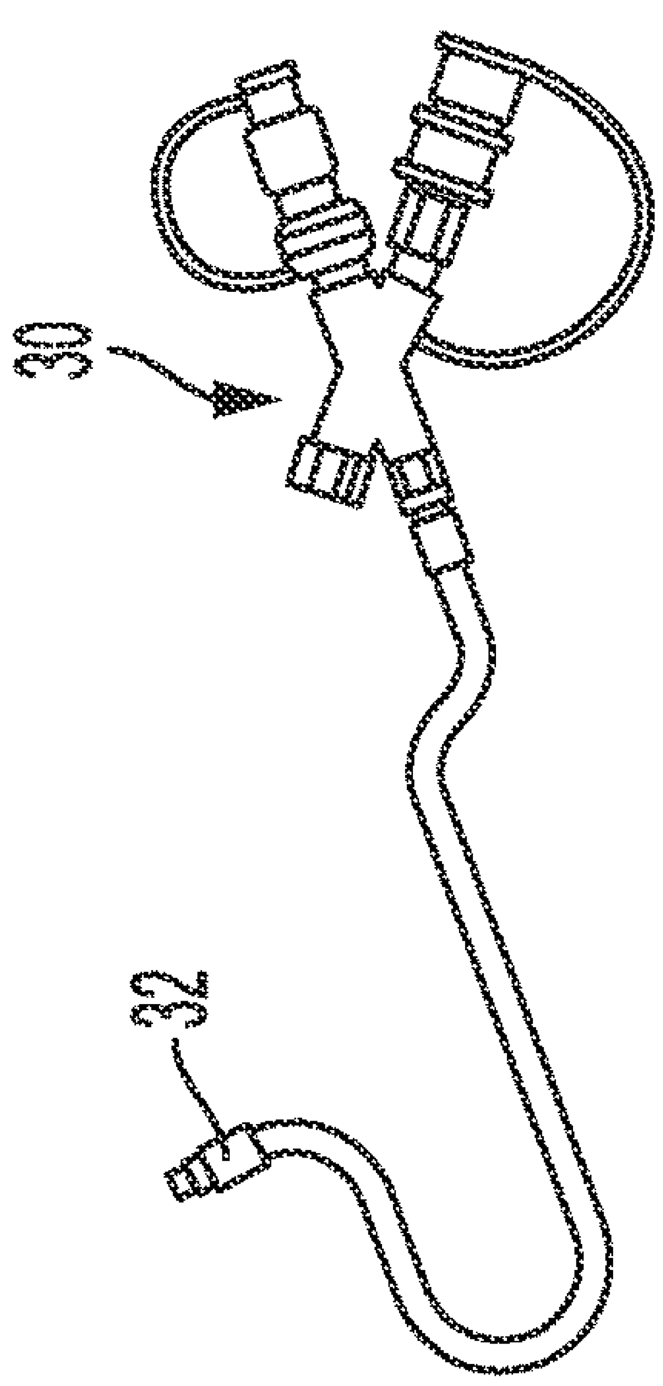

FIGURE 1a
(PRIOR ART)

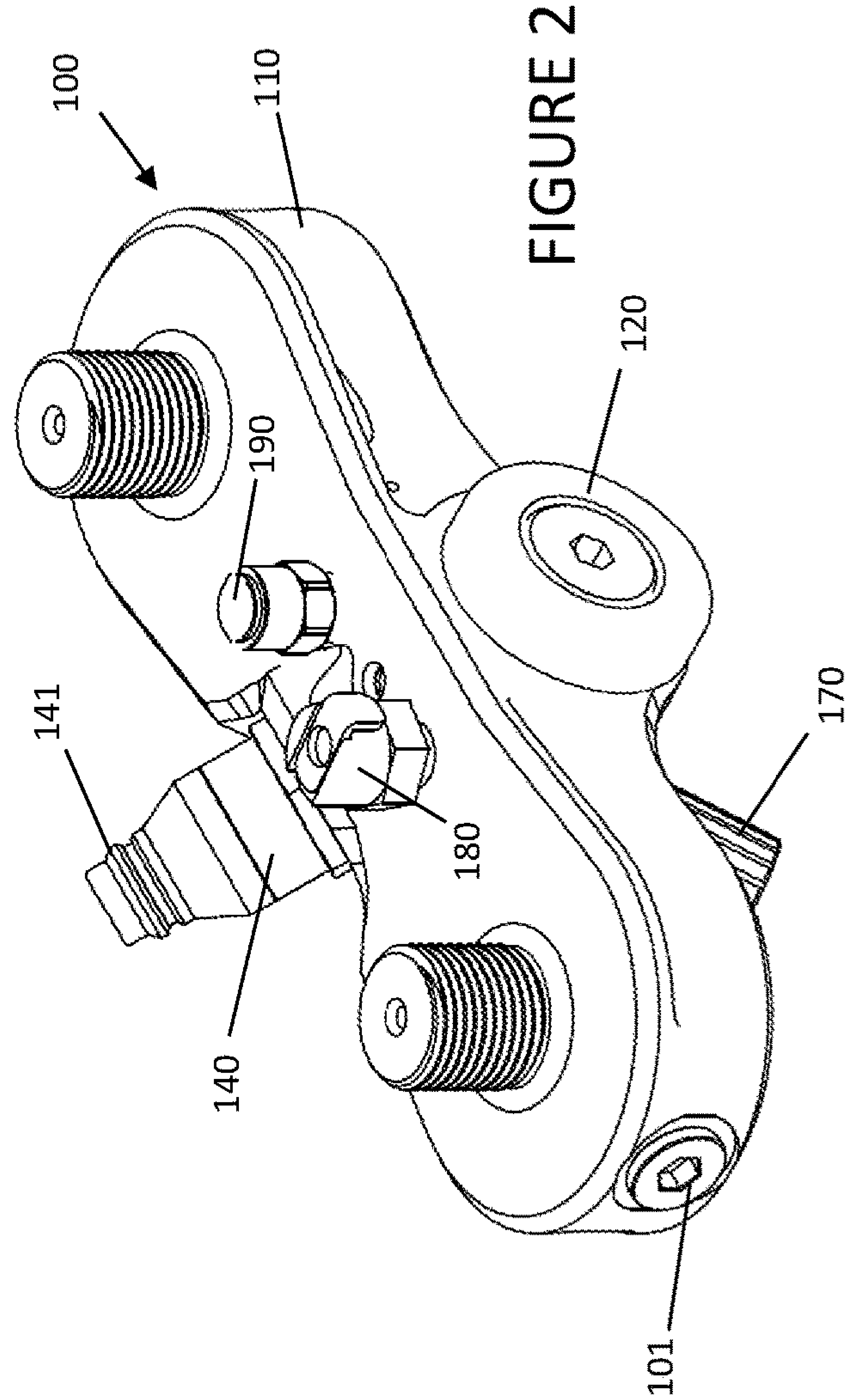

FIGURE 2

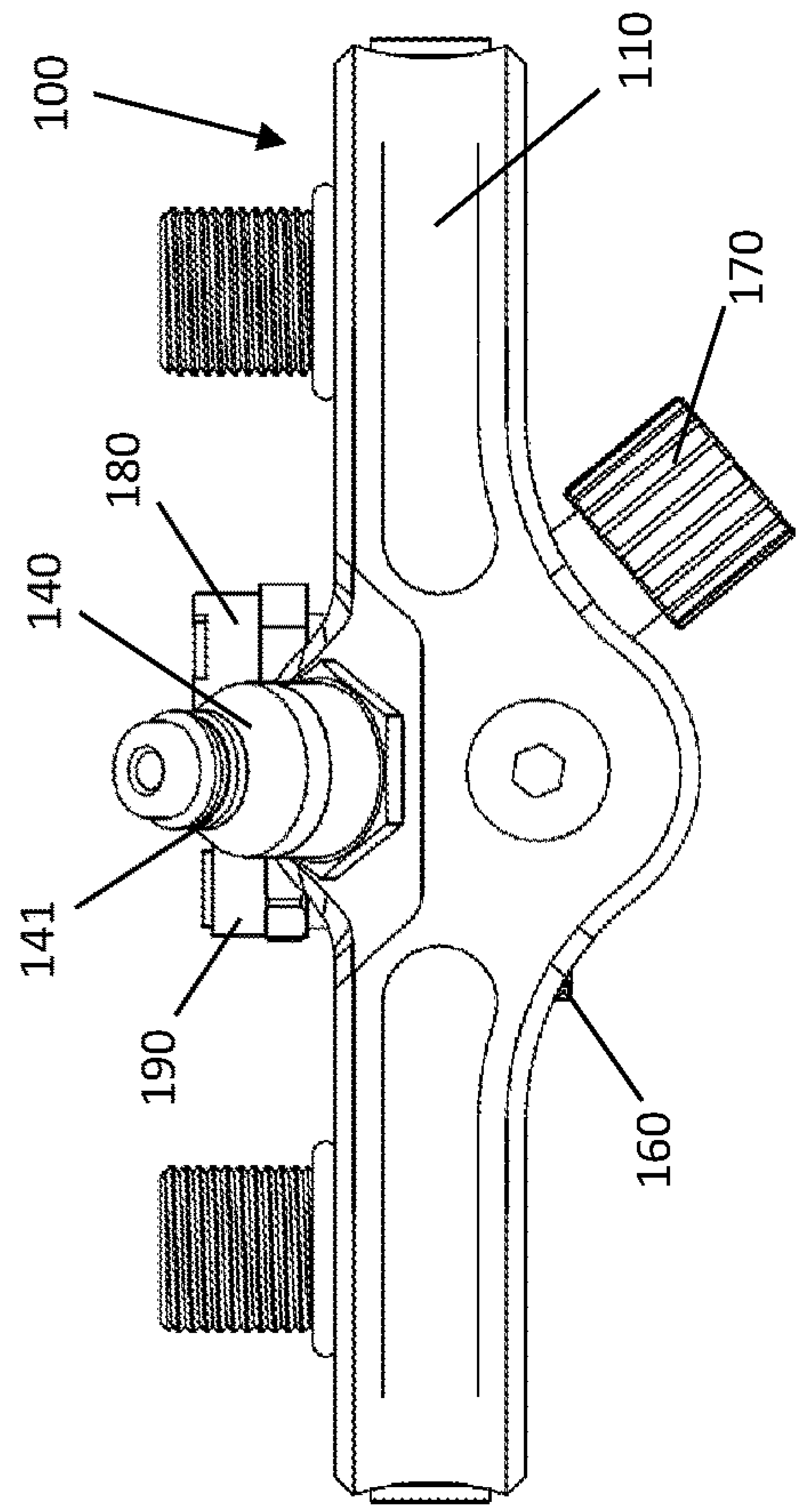

FIGURE 4

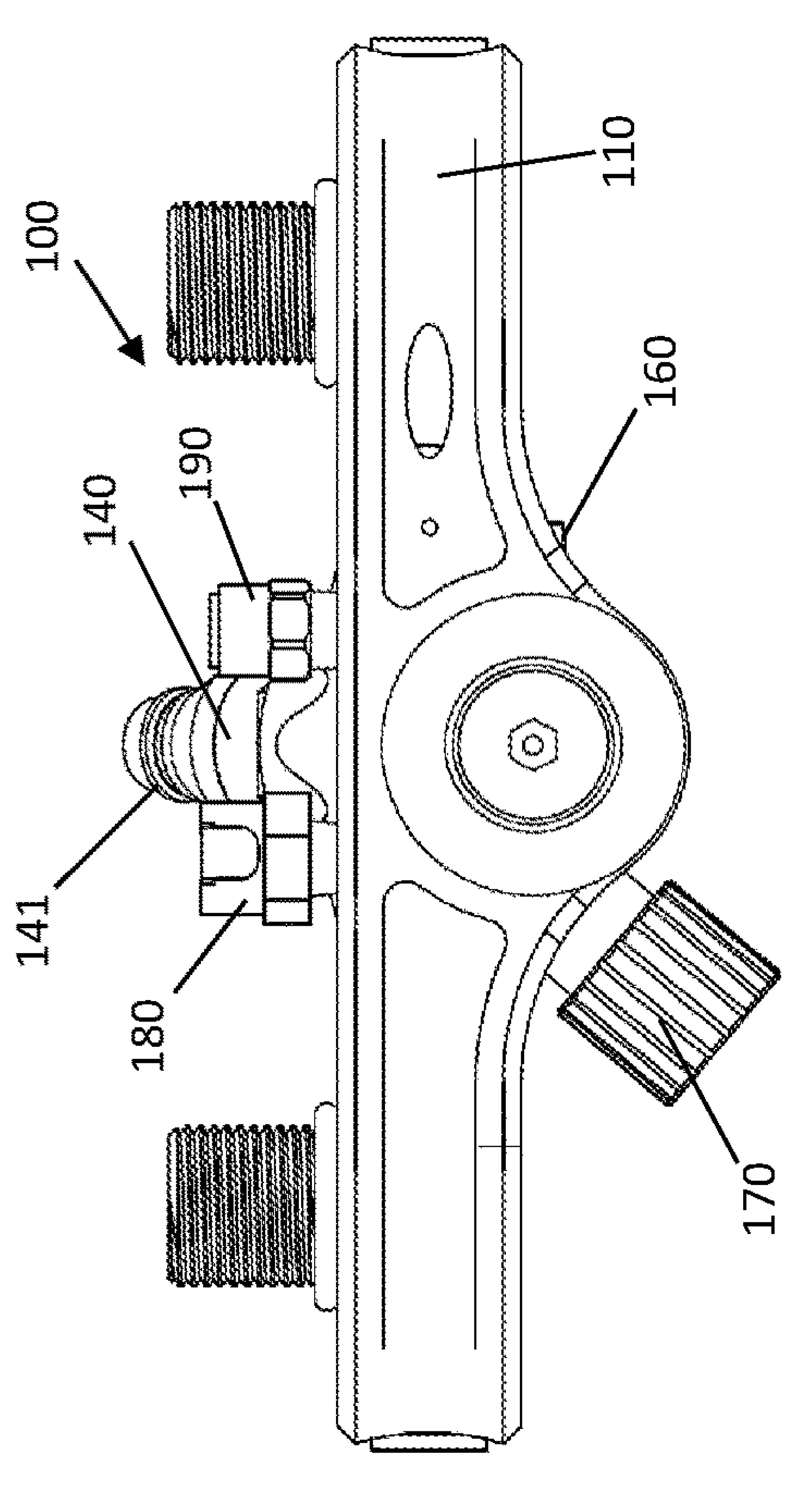

FIGURE 3

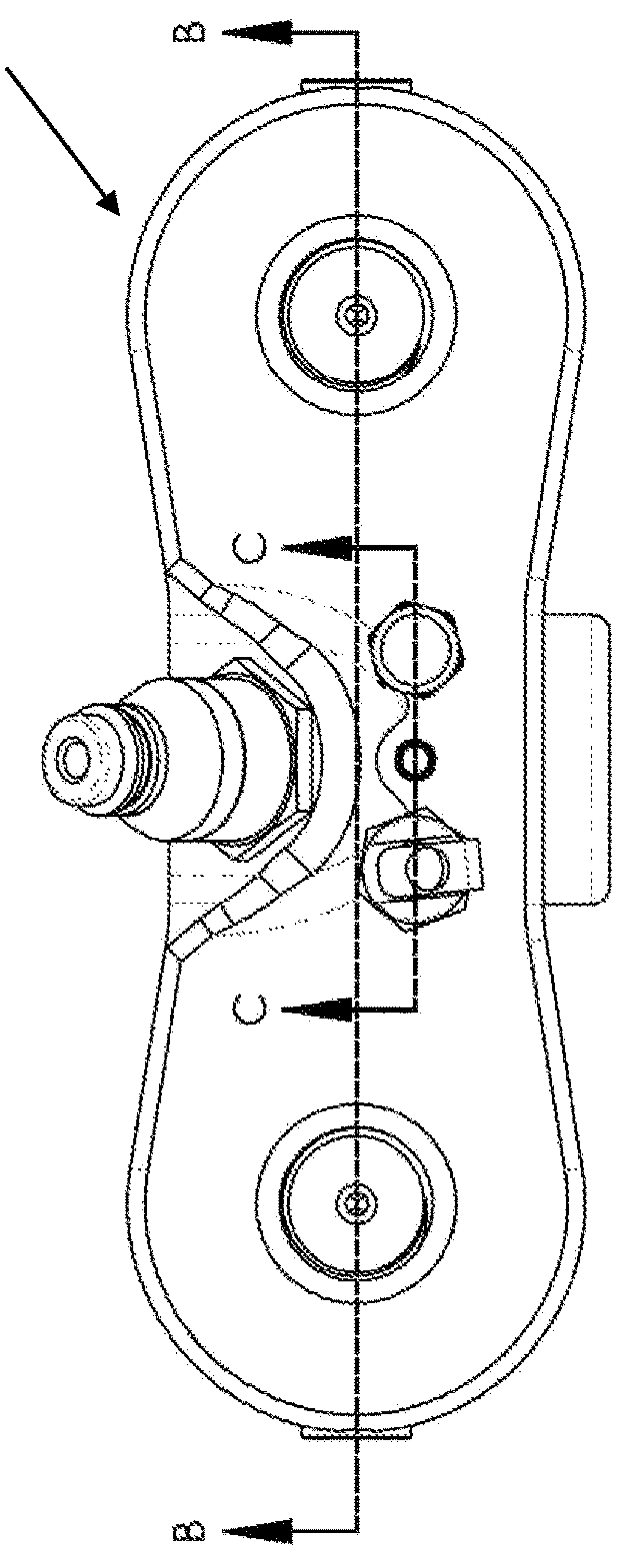

FIGURE 5

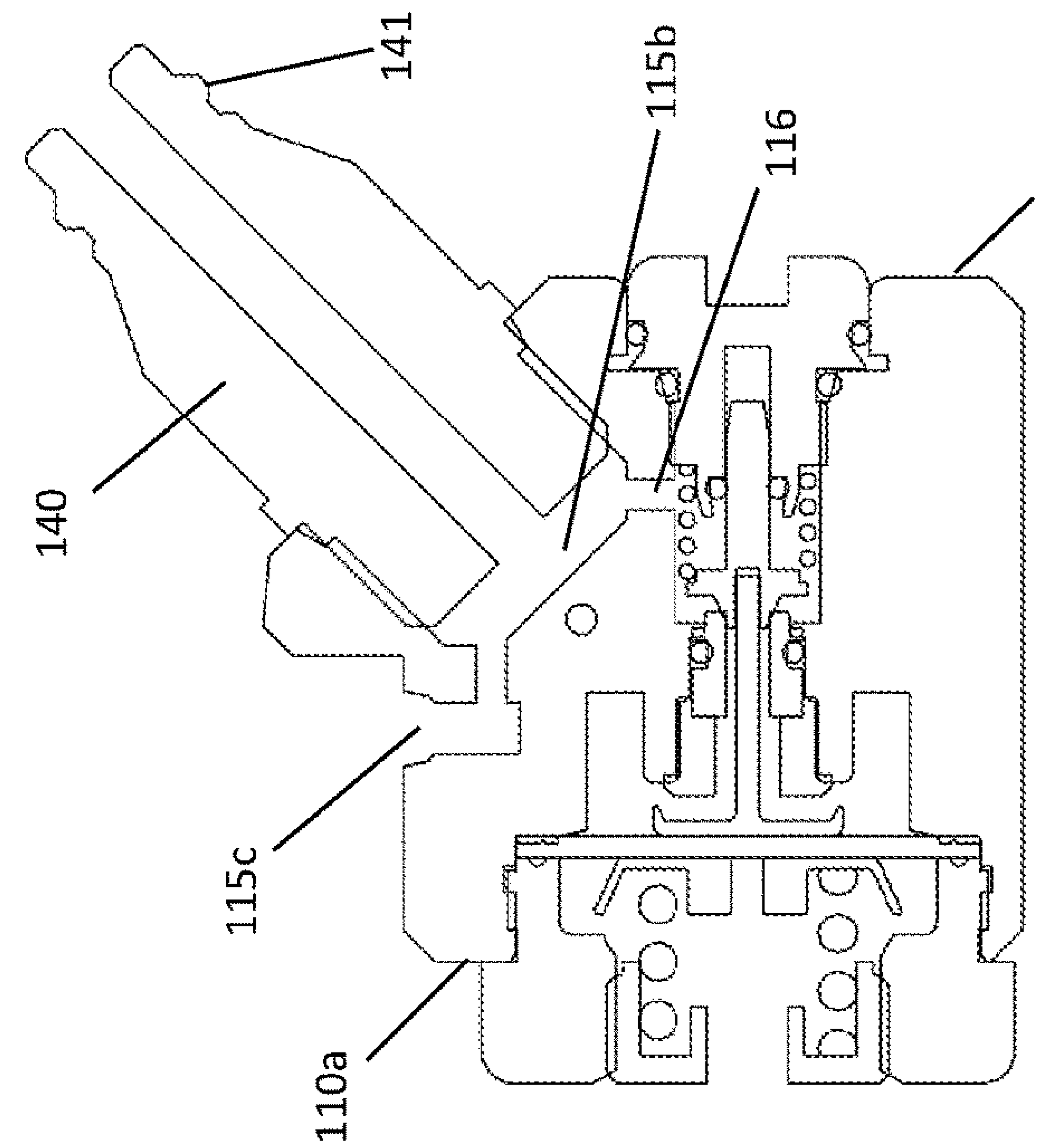

FIGURE 7

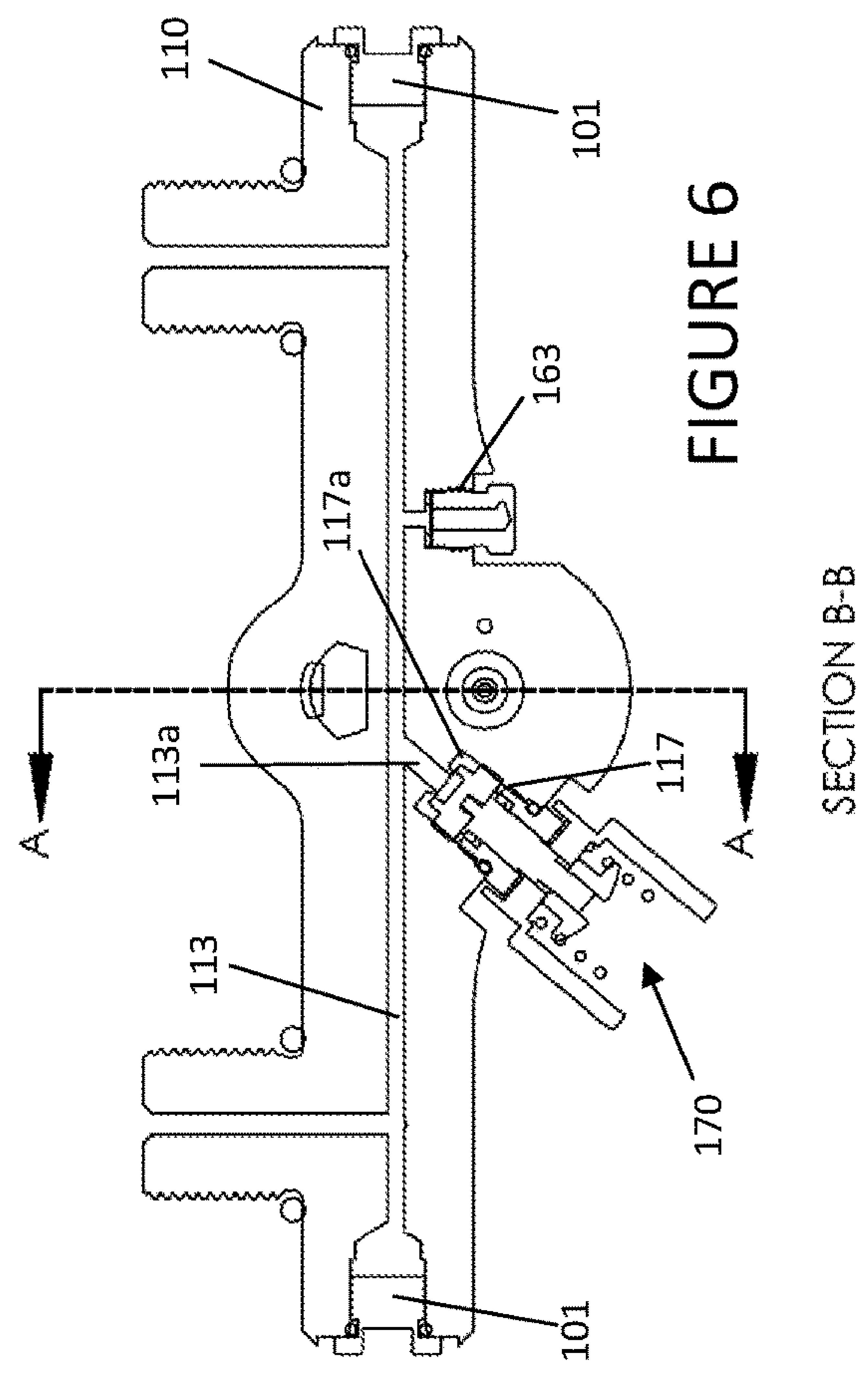

FIGURE 6

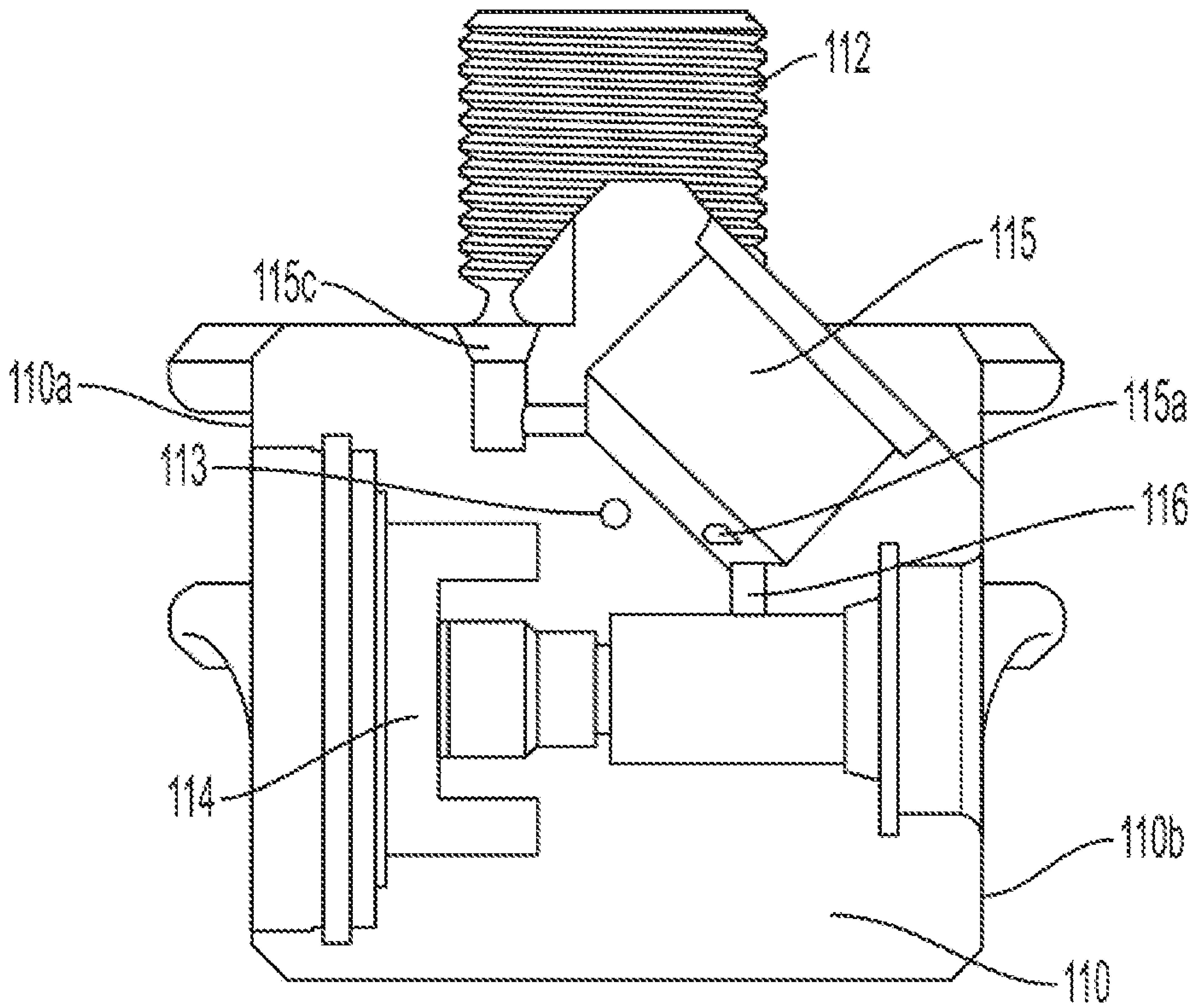

FIGURE 7a

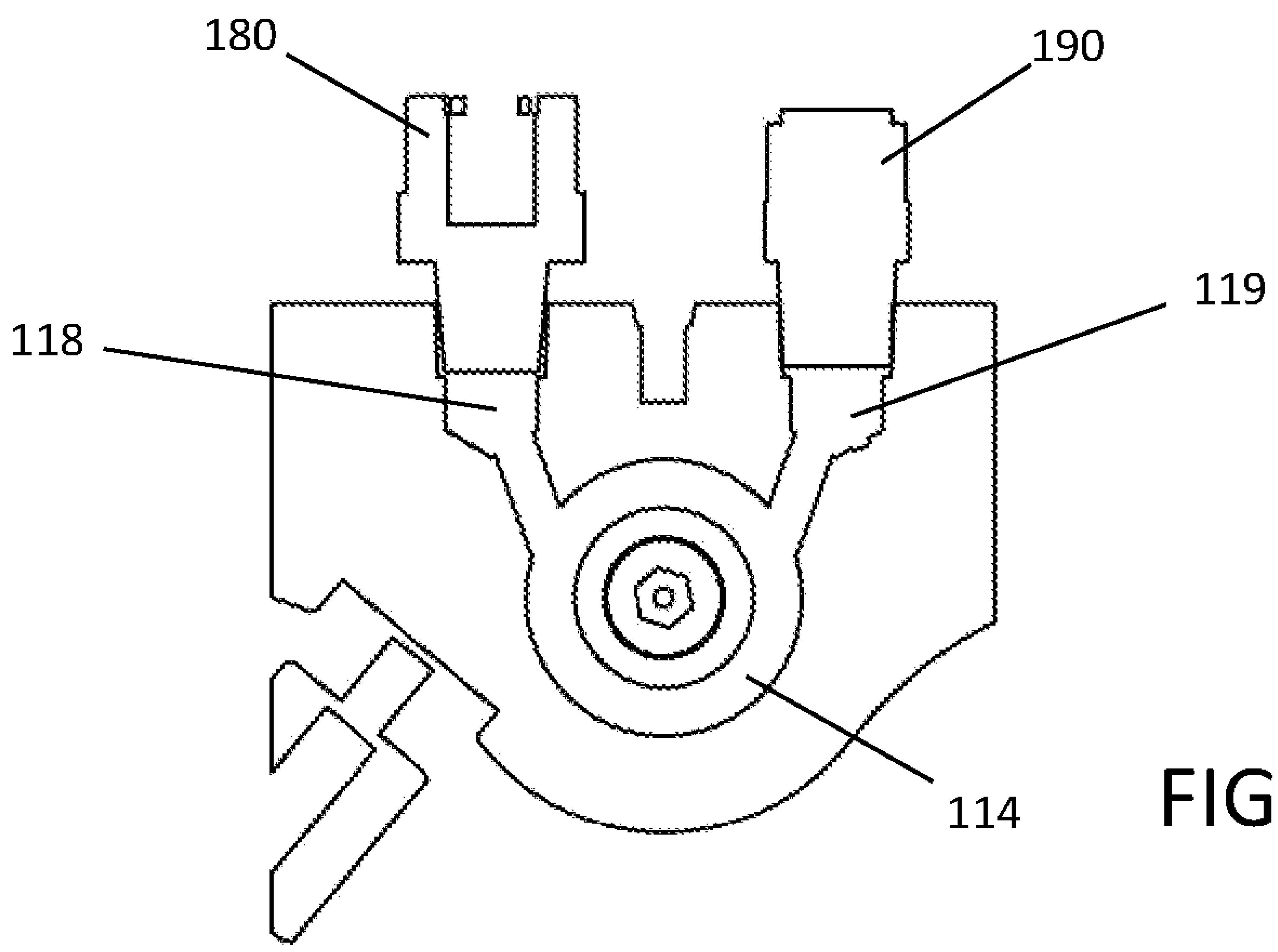

FIGURE 8

SECTION C-C

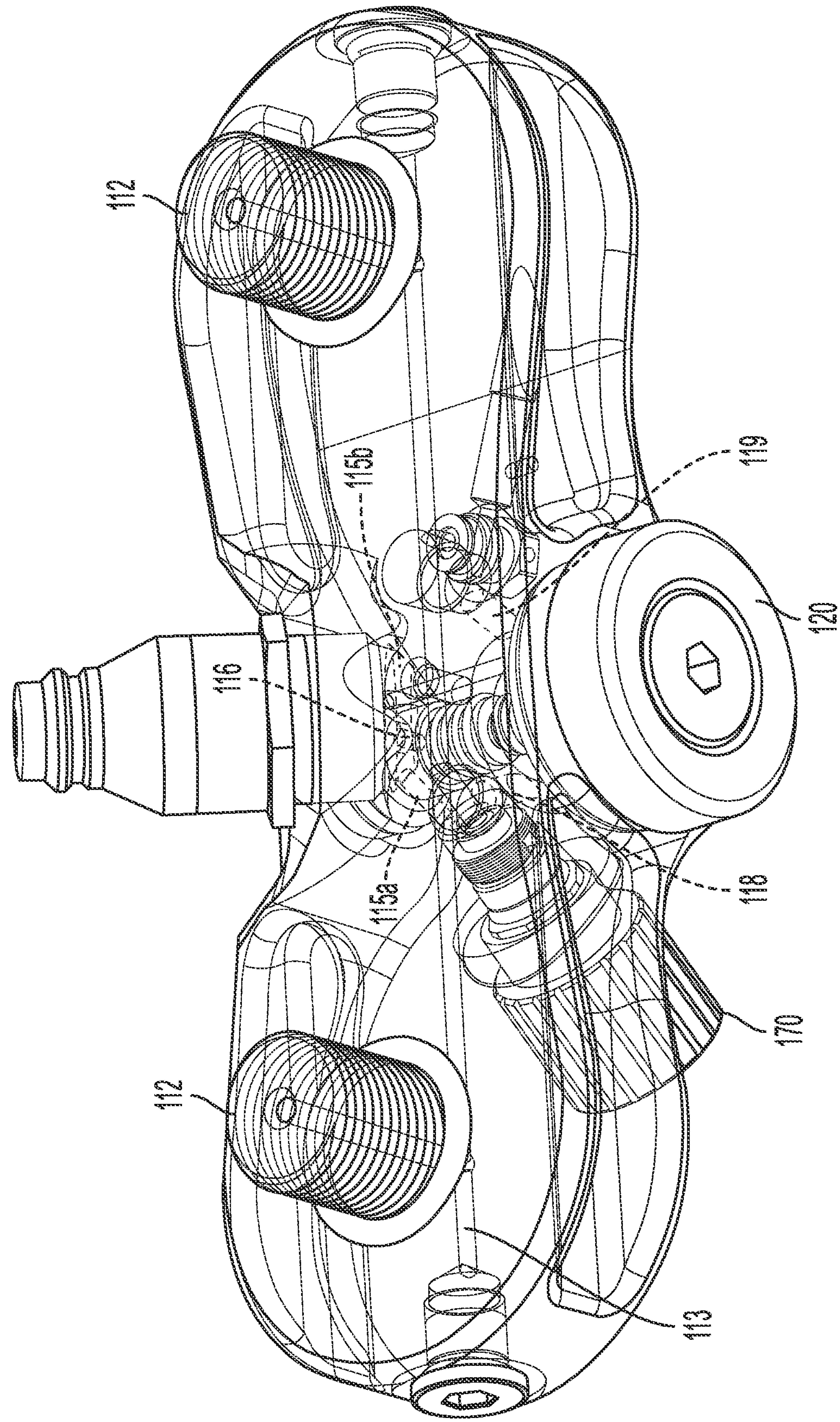

FIGURE 9

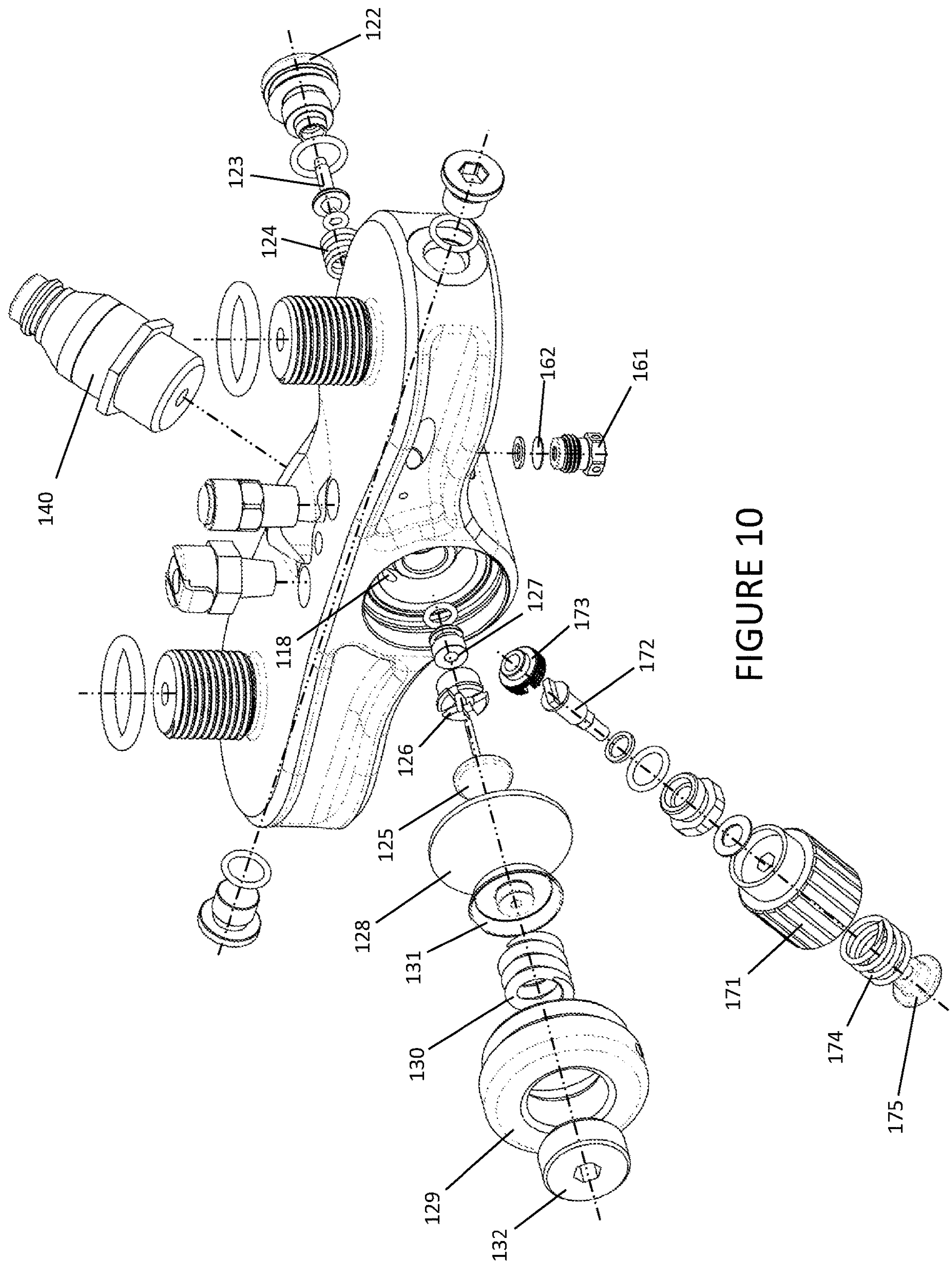
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FIGURE 10

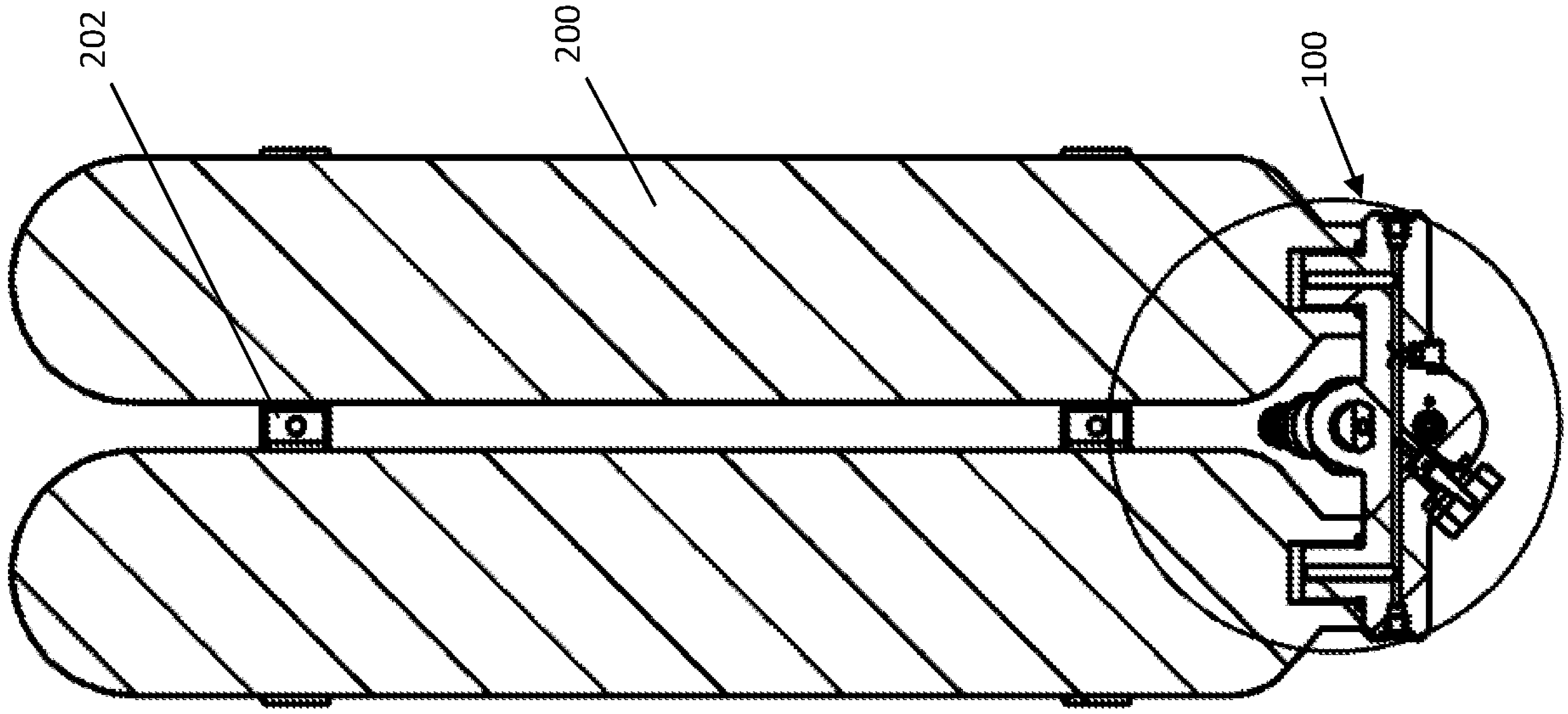

FIGURE 12

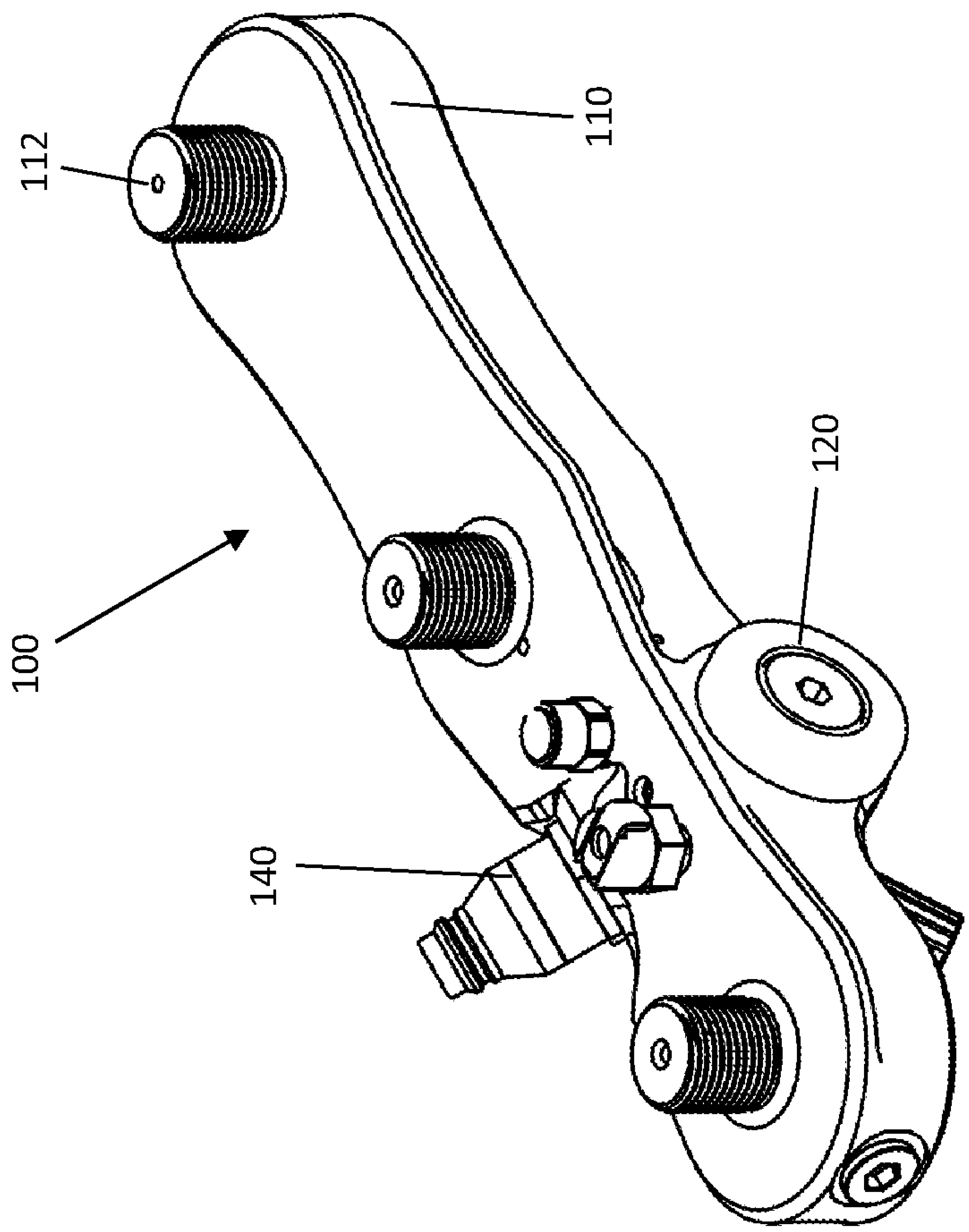

FIGURE 11

INTEGRATED MANIFOLD SYSTEM

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of U.S. Non-provisional application Ser. No. 16/137,847, titled "Integrated Manifold System," filed Sep. 21, 2018, now U.S. Pat. No. 11,369,813, which claims the benefit of U.S. Provisional Application No. 62/563,714 titled "Integrated Manifold System," filed Sep. 27, 2017 by the inventor herein, which application is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

This invention relates to systems and devices for the pressure-regulated supply of gases, and more particularly to a system and device providing a pressure-regulated supply of pressurized, breathable air, oxygen, or other gases in a compact, light-weight assembly.

BACKGROUND OF THE INVENTION

First responders, members of the military, emergency personnel, and others are frequently confronted with inhospitable breathing environments, such as may occur in the event of fire, a hazardous chemical spill, a nuclear, chemical, or biological attack, or the like. In order to allow such personnel to accomplish their mission in such environment, various systems have been developed to provide the individual with personal breathing apparatus that ensures them of a clean, safe breathing environment, even when operating in the hostile environment. However, such operators are often placed under significant physical and other stress when operating in those environments, and are often confronted with small or obstructing spaces in which to operate. While previously known systems have been able to provide the operators secure breathing environments, their bulky size has made operation in highly stressful and/or obstructive environments quite challenging. Thus, there remains a need in the art to provide a system and apparatus that can reliably provide a safe, secure breathing environment but that minimizes the overall profile (i.e., physical size and weight) of the system so as to ease the stress on the operator during use.

SUMMARY OF THE INVENTION

Disclosed herein is an integrated manifold system, usable for instance in self-contained breathing applications, that combines in a single, compact, unitary assembly a one-piece, machined manifold for connecting air supply cylinders with a first stage regulator and recharge port, providing a significant improvement over previously known systems, as it reduces potential points of failure in the system, reduces overall weight of the system, and eases the burden on the operator by not requiring them to carry and keep track of multiple, separate components for these features. While the exemplary embodiment described herein is principally with reference to the delivery of breathable air to an operator in an environmentally hazardous application, the system may likewise be used, by way of non-limiting example, to provide pressure-regulated delivery of high pressure, pure oxygen, such as might be desirable in medical procedures for delivering oxygen to a patient, in exothermic breaching applications using exothermic torch devices that employ oxygen, and such other applications that my require the portable delivery of pressure-regulated gases as will occur to those skilled in the art.

In accordance with certain aspects of an embodiment of the invention, an air supply system is disclosed comprising: a one-piece manifold body having at least one bottle port configured to removably receive a bottle of pressurized air, a first stage regulator chamber, a quick disconnect fitting port, an air channel in fluid communication with the at least one bottle port and the first stage regulator chamber, and an outlet channel in fluid communication with the first stage regulator chamber.

In accordance with further aspects of an embodiment of the invention, an air supply system is disclosed comprising: a one-piece manifold body having at least one bottle port configured to removably receive a bottle of pressurized air, a first stage regulator chamber, a quick disconnect fitting port, an air channel in fluid communication with the at least one bottle port and the first stage regulator chamber, and an outlet channel in fluid communication with the first stage regulator chamber; a first stage regulator operatively engaging the first stage regulator chamber; a mask hose quick disconnect in fluid communication with the outlet channel and configured to removably receive an air hose; and an on/off valve operatively engaging the air channel to regulate air flow between the at least one bottle port and the first stage regulator.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the present invention and together with the below description, serve to explain the principles of the invention.

FIG. **1** illustrates a front view of a prior art manifold for attaching air cylinders with the separate elements of a first stage regulator and recharge assembly.

FIG. **2** illustrates a perspective view of an integrated manifold system in accordance with certain aspects of an embodiment of the invention.

FIG. **3** illustrates a front view of the integrated manifold system of FIG. **2**.

FIG. **4** illustrates a back view of the integrated manifold system of FIG. **2**.

FIG. **5** illustrates a top view of the integrated manifold system of FIG. **2**.

FIG. **6** is a cross-sectional view of the integrated manifold system of FIG. **5** along section line B-B.

FIG. **7** is a cross-sectional view of the integrated manifold system of FIG. **5** along section line A-A-.

FIG. **7***a* is a cross-sectional view of only the manifold body of FIG. **5** along section line A-A.

FIG. **8** is a cross-sectional view of the integrated manifold system of FIG. **5** along section line C-C

FIG. **9** is a perspective view of the integrated manifold system of FIG. **2** with the manifold body shown in phantom.

FIG. **10** is an exploded view of the integrated manifold system of FIG. **2**.

FIG. **11** is a perspective view of an integrated manifold system in accordance with further aspects of an embodiment of the invention.

FIG. **12** is a front, cross-sectional view of the manifold system of FIG. **2** including air bottles attached to the manifold body.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention summarized above may be better understood by referring to the following description, claims, and accompanying drawings. This description of an embodiment, set out below to enable one to practice an implementation of the invention, is not intended to limit the preferred embodiment, but to serve as a particular example thereof. Those skilled in the art should appreciate that they may readily use the conception and specific embodiments disclosed as a basis for modifying or designing other methods and systems for carrying out the same purposes of the present invention. Those skilled in the art should also realize that such equivalent assemblies do not depart from the spirit and scope of the invention in its broadest form.

FIG. **1** shows a prior art manifold system **10** for connecting high pressure air bottles (not shown) to a first stage regulator **20**, which first stage regulator **20** in turn delivers air to a second stage regulator on an operator's mask (not shown), such as a gas mask. Manifold **10** includes bottle ports **12** that removably receive high pressure air bottles or canisters, which deliver air through an internal port to a regulator adapter **14** that removably receives a first stage regulator **20**. First stage regulator **20** typically includes a low pressure hose attachment **22** for delivering air pressure through a hose to the operator's mask, and a low pressure relief valve **24** to allow an operator to regulate the amount of pressure delivered to their mask and/or to allow air exceeding a desired pressure to be bled from the regulator **20**. First stage regulator **20** also typically includes an on/off valve **25** that controls delivery of air from regulator adapter **14** into first stage regulator **20**. Manifold **10** typically includes a high pressure relief valve **16** that is attached to manifold **10** with yet another separate fitting to allow emergency release of air pressure from the system. Moreover, in order to recharge canisters attached to manifold **10**, a separate recharge assembly **30** must be provided and carried by the operator. Such recharge assembly **30** includes a hose fitting **32** that must be fitted to yet another fitting (not shown) on manifold **10** in order to allow refill of air canisters attached to manifold **10** through cylinder ports **12**.

Such prior art assemblies have disadvantages for the operator, particularly when working in high-stress environments, as well as for the manufacturer or supplier of such systems. The various adapters necessary for attachment of the first stage regulator **20**, the high pressure relief valve **16**, and the recharge port **30** all create potential points of failure, and overall add weight to the system that the operator must carry. Moreover, such varied components add unnecessary complexity to the system which increases costs in materials and manufacturing.

FIGS. **2**, **3**, and **4** show top perspective, front, and back views, respectively, of an improved manifold system **100** in accordance with certain aspects of an embodiment of the invention, which integrates a first stage regulator **120**, a male quick disconnect **140** for recharging bottles attached to manifold system **100** and for providing an alternative source of air to manifold system **100**, a high pressure relief valve **160**, an on/off valve **170**, a low pressure hose attachment **180**, and a low pressure relief valve **190** all in a single, unitary manifold body **110**. Such assembly significantly improves upon previously known assemblies by dramatically decreasing the number of adapter and integration fittings required for assembly of the foregoing components, and by making the entire assembly lighter and smaller (and thus of less physical load on the operator), while likewise improving quality control and assembly time by having fewer potential points of failure.

With continued reference to FIGS. **2-4**, the top view of manifold system **100** of FIG. **5**, and the various cross-sectional views of manifold system **100** of FIGS. **6-9**, manifold body **110** is a single, unitary (i.e., one piece) assembly. In a particularly preferred embodiment, manifold body **110** may be milled out of billet aluminum. In other configurations, such as when manifold **100** is intended for use in the pressure-regulated delivery of high pressure oxygen, manifold **100** may be milled out of brass, titanium, or such other materials as may be best suited to a particular application, as may be selected by persons skilled in the art. Manifold body **110** includes bottle ports **112** that removably receive readily commercially available air cylinders (not shown) of standard configuration, which cylinders are available from a variety of manufactures. With particular reference to the cross-sectional view of FIG. **7***a* (along section line A-A of FIG. **6**) showing manifold body **110** with all other elements removed, manifold body **110** is milled to form a first stage regulator chamber **114** extending from a front side **110***a* of manifold body **110**, through manifold body **110** and to a back side **110***b* of manifold body **110**, which first stage regulator chamber **114** is shaped to receive first stage regulator **120**. Manifold body **110** is further milled to form a quick disconnect fitting port **115** configured to removably receive, such as by way of a threaded connection, male quick disconnect **140**, and a high pressure feed port **116** that fluidly communicates quick disconnect fitting port with **115** with first stage regulator chamber **114**. Still further, manifold body **110** is milled to form on/off valve receiver **117** configured to removably receive, such as by way of a threaded connection, on/off valve **170**. On/off valve receiver **117** is in fluid communication with high pressure air channel **113**, such that (as discussed in greater detail below and with reference to FIG. **10**) on/off valve **170** in on/off valve receiver **117** is operative to control air flow from high pressure air channel **113** into a head space **117***a* (FIG. **6**) at the top end of on/off valve receiver **117**. Head space **117***a* of on/off valve receiver **117** is also in fluid communication with quick disconnect fitting port **115** via inlet **115***a*, such that when on/off valve **170** is open, air flows from air bottles attached to bottle ports **112**, through high pressure air channel **113**, into head space **117***a* of on/off valve receiver **117**, and out of head space **117***a* through inlet **115***a* into quick disconnect fitting port **115**. From quick disconnect fitting port **115**, high pressure air is then delivered through high pressure feed port **116** into first stage regulator chamber **114**, and as discussed in greater detail below, is ultimately delivered from first stage regulator chamber **114** through outlet channel **118** (FIG. **8**) which is likewise milled into manifold body **110**. An outer end of outlet channel **118** is configured to receive low pressure hose attachment **180** for delivering air from manifold system **100** to a user's mask. Preferably, a relief valve channel **119** is also milled into manifold body **110** and is similarly in communication with first stage regulator chamber **114**, and receives low pressure relief valve **190** at an outer end of relief valve channel **119**.

As mentioned above, and with particular reference to FIGS. **6** and **9** and the exploded view of FIG. **10**, on/off valve **170** controls the flow of air from high pressure air channel **113** to quick disconnect fitting port **115**. In that regard, on/off valve **170** includes a manually operable hand wheel **171**, a valve stem **172**, and a plug **173** engaged by valve stem **172** to open and close port **113***a* that communicates high pressure air channel **113** with head space **117***a*. Plug **173** is biased by spring **174** (the biasing force of which is adjustable via nut **175**) towards closure of port **113***a*, with the closing force being adjustable by turning hand wheel **171** so as to allow pressurized air to flow from high pressure air channel **113**, into head space **117***a*, and through inlet **115***a* to quick disconnect fitting port **115**. In certain embodiments, on/off valve receiver **117** preferably forms a downwardly angled opening in manifold body **110**, which positions hand wheel **171** for access by an operator from the underside of manifold body **110**, extending downward and to one side of manifold body **110** to allow easy access to an operator when reaching around their body to control the manifold system **100**, without requiring the operator to remove the system from their back to turn the system on and off.

Thus, when on/off valve **170** is opened, full bottle pressure is introduced from bottle ports **112** into air channel **113**, to head space **117***a*, through inlet **115***a* into quick disconnect fitting port **15**, and from disconnect fitting port **15** through high pressure feed port **121** into first stage regulator **120**.

With continued reference to FIGS. **6**, **9**, and **10**, high pressure relief valve **160** is provided in an underside of manifold body **110**. High pressure relief valve **160** includes a burst plug **161** and a burst safety disc **162** in fluid communication with high pressure air channel **113**. In certain embodiments, high pressure relief valve receiver **163** is milled into a bottom face of manifold body **110** on an opposite side of first stage regulator **120** from on/off valve receiver **117** and extends vertically from the bottom face of manifold body **110** into high pressure air channel **113**, and removably receives (such as by way of non-limiting example via a threaded connection) high pressure relief valve **160** therein. This configuration positions high pressure relief valve **160** largely within the profile of manifold body **110** so as to avoid unnecessary obstructions on the exterior of manifold system **100**. In the event of an overpressure condition occurring in air bottles attached to bottle ports **112** and/or in high pressure air channel **113**, high pressure relief valve **160** will burst and allow air within high pressure air channel **113** to escape from the bottom of manifold body **110** to atmosphere, thus avoiding the risk of inadvertently delivering over-pressure air into regulator **120**, which could damage the components of regulator **120**. Importantly, high pressure relief valve receiver **163**, and thus high pressure relief valve **160** itself, is pressurized at any time that air bottles connected to manifold system **100** see pressure, thus ensuring that the pressure relief valve **160** cannot be bypassed. Likewise, the downward vertical orientation of high pressure relief valve receiver **163** ensures that in the event that such pressure relief valve **160** bursts, the escaping high pressure air stream is directed downward so as to not cause injury to the operator or damage to other operator-worn equipment.

Preferably blanking plugs **101** are removably positioned in manifold body **110** at opposite ends of high pressure air channel **113** which, when fully installed, seal air channel **113**. Such blanking plugs **101** may provide access to air channel **113**, thus allowing additional components (sensors, etc.) to be added to manifold system **100**.

With continued reference to FIGS. **6**, **9**, and **10**, male quick disconnect **140** may be removably positioned (such as, by way of non-limiting example, through a threaded connection) within quick disconnect fitting port **115**. Quick disconnect fitting port **115** is milled into manifold body **110** at a downward angle and in line with an imaginary axis extending through first stage regulator **120**, which positions quick disconnect **140** so that its inlet points upward and away from manifold body **110** towards the rear side of manifold body **110**. This configuration allows easy connection of a high pressure air supply without interfering with additional equipment that may be carried on the operator's back.

Quick disconnect **140** includes a fitting **141** configured to receive a quick connect adapter from a hose that may supply high pressure air to manifold system **100**, and includes a check valve (not shown) of standard configuration to allow airflow into quick disconnect fitting port while preventing air from escaping in the opposite direction. Quick disconnect **140** is sized such that when it is positioned in quick disconnect fitting port **115**, the base **142** of quick disconnect **140** is spaced apart from an inner wall of disconnect fitting port **115** so as to define a head space **115***b*, which as explained above receives high pressure air through inlet **115***a* (FIG. **7***a*), and delivers air to first stage regulator **120** through high pressure feed port **116**. In the event that on/off valve **170** is closed, such that no air is delivered to head space **115***b* from inlet **115***a* (and thus from bottles attached to bottle ports **112**), air may still be provided into first stage regulator by connecting a source of high pressure air to male quick disconnect **140**. In this configuration, the external source of air connected to male quick disconnect **140** may allow the operator to use manifold system **100** with such source of air delivering breathable air through first stage regulator **120** instead of air from bottles attached at bottle ports **112**, thus allowing air within those bottles to be saved when desired, and/or provide air when such bottle supply is depleted. Likewise, when an external source of air is connected to male quick disconnect **140** and on/off valve is opened, air may flow through quick disconnect **140** into head space **115***b*, out through inlet **115***a* and into high pressure air channel **113**, and from high pressure air channel **113** into bottles attached to bottle ports **112** for purposes of refilling those bottles with usable air, all without requiring attachment of a separate recharge assembly **30** (FIG. **1**) as required by previously known systems.

Optionally and if desired for certain operations, an adapter (not shown) may alternatively be provided having a bottom portion configured identical to the bottom portion of quick disconnect **140** for removable fitment within quick disconnect fitting port **115**, which adapter may then connect, such as by way of a hose, to a remote quick disconnect fitting **140** (such as where a refilling air supply is positioned remotely from an operator that is using the improved manifold system **100**).

Still further, and as best viewed in FIG. **7**, an auxiliary gauge port **115***c* is preferably milled into manifold body **110** from a top face of manifold body **110** so as to be in fluid communication with head space **115***b*. Gauge port **115***c* may removably receive a gauge (not shown), such as a pressure gauge, through (by way of non-limiting example) a threaded connection. Through positioning of such auxiliary gauge port **115***c* in direct fluid communication with head space **115***b*, a pressure reading is provided that shows actual pressure that is being supplied through high pressure feed port **116** into first stage regulator **120**, as opposed to merely providing current air pressure within bottles attached to bottle ports **112**. This configuration ensures that the operator has a correct indicator of pressure being supplied to first stage regulator **120** regardless of the condition of the bottles attached to bottle ports **112**. In the event that a pressure gauge is not required or desired for a given operation, it may be removed from auxiliary gauge port **115***c* and a removable plug may be placed in auxiliary gauge port **115***c*.

As explained above, and with particular reference to FIGS. **7**, **9**, and **10**, first stage regulator **120** extends through first stage regulator chamber **114** from a front side **110***a* of manifold body **110** to a back side **110***b* of manifold body **110**. The portion of regulator **120** that is nearest the back side **110***b* of manifold body **110** comprises the high pressure portion of regulator **120**, while the portion that is nearest the front side **110***a* of manifold body **110** comprises the low pressure portion of regulator **120** that feeds air outlet channel **118**. Thus, the high pressure side of regulator **120** includes a balance plug **122** at an outer-most portion of regulator **120**, a valve **123**, and a valve spring **124**. A diaphragm lifter **125** extends through a seat support **126** and orifice seat **127** into a head end of valve **123**, and at an opposite end engages a diaphragm **128** that controls air flow from first stage regulator chamber **114** of manifold body **110** into outlet channel **118** (and thus to low pressure hose attachment **180**). Diaphragm **128** is held against a seat formed by first stage regulator chamber **114** by a diaphragm clamp ring **129**, and is biased toward a closed, sealing position by spring **130** and spring carrier **131**, the biasing force of which may be adjusted by spring adjuster **132**.

As shown in FIG. **12** depicting manifold system **100** with air cylinders **200** positioned thereon, manifold body **110** preferably has a total length dimension that is less than the total width of the air cylinders **200** and a carrier **202** that holds cylinders **200**, thus significantly reducing the profile of manifold **100** and allowing far greater maneuverability of the operator over previously known configurations.

As mentioned above, manifold system **100** includes low pressure hose attachment **180** removably attached to outlet channel **118** in manifold body **110** and configured for attachment to a hose to deliver breathable air from the low pressure outlet side of first stage regulator **120** to, by way of non-limiting example, a second stage regulator on an operator's mask. Low pressure hose attachment **180** is positioned to one side of male quick disconnect **140**. A quick disconnect fitting of standard configuration may be included on low pressure hose attachment **180**, allowing quick connect and quick disconnect of a supply hose (not shown) that, in turn, ultimately delivers breathable air to the operator through, by way of non-limiting example, a respirator mask.

Similarly, low pressure relief valve **190** is configured to allow excess pressure in the low pressure outlet side of first stage regulator **120** to automatically be bled from the low pressure side of first stage regulator **120**. Low pressure relief valve **190** is attached to relief valve channel **119** in manifold body **110**, which relief valve channel **119** is in fluid communication with the low pressure outlet side of first stage regulator **120**. Low pressure relief valve **190** is positioned to a second side of male quick disconnect **140** opposite low pressure hose attachment **180**.

The combination disclosed herein of a single, compact, unitary assembly of a manifold body for connecting air supply bottles with a first stage regulator is a significant improvement over previously known systems, as it reduces potential points of failure in the system, reduces overall weight of the system, and eases the burden on the operator by not requiring them to carry and keep track of multiple, separate components for these features. Further beneficial features of the manifold system described herein likewise include the addition of a male quick disconnect **140** enabling cylinder recharge and alternative air supply to that provided by the bottles, an on/off valve **170**, and pressure safety devices again all in a single, compact assembly. Previously known systems have typically required separate assemblies with various flow lines among them to achieve these varied functions of a respirator system, and such dispersed components have added size and weight to those systems that make it difficult for the user to operate, particularly in stressful environments. Those skilled in the art will appreciate that a system configured in accordance with the invention will significantly reduce the stress experienced by an operator in a dangerous environment, while ensuring that they have ready and continuous access to a reliable breathable air delivery system.

Having now fully set forth the preferred embodiments and certain modifications of the concept underlying the present invention, various other embodiments as well as certain variations and modifications of the embodiments herein shown and described will obviously occur to those skilled in the art upon becoming familiar with said underlying concept. By way of non-limiting example, and with reference to FIG. **11**, manifold body **110** may include more than 2 bottle ports **112** by simply extending the length of manifold body **110** and air channel **113** that interconnects bottle ports **112**. Similarly, only one bottle port **112** may be provided to further limit the physical profile of the manifold system **100**. It should be understood, therefore, that the invention may be practiced otherwise than as specifically set forth herein.

What is claimed is:

1. An air supply system comprising:

a one-piece manifold body having a top side, a bottom side opposite said top side, a front side extending between said top side and said bottom side, and a back side opposite said front side, said one-piece manifold body further comprising:

a plurality of bottle ports on said top side of said manifold body;

a first stage regulator chamber extending through said manifold body from said front side to said back side;

an air channel in fluid communication with said bottle ports and said first stage regulator chamber;

an outlet channel in fluid communication with said first stage regulator chamber; and

a quick disconnect fitting port positioned between said bottle ports; and

a first stage regulator further comprising a diaphragm and a valve positioned within said first stage regulator chamber, wherein said first stage regulator extends horizontally through said first stage regulator chamber between the plurality of bottle ports from the front side of said manifold body to the back side of said manifold body.

2. The air supply system of claim **1**, further comprising

a mask hose quick disconnect attachment in fluid communication with said outlet channel and configured to removably receive an air hose.

3. The air supply system of claim **1**, further comprising an on/off valve operatively engaging said air channel to regulate air flow between said at least one bottle port and said first stage regulator chamber.

4. The air supply system of claim **3**, wherein a manually operable hand wheel of said on/off valve extends outward from said one-piece manifold body from a bottom side of said one-piece manifold body.

5. The air supply system of claim **4**, wherein said on/off valve extends angularly outward from said one-piece manifold body at a non-vertical angle.

6. The air supply system of claim **3**, further comprising a quick disconnect fitting removably mounted in said quick disconnect fitting port and configured for connection to an air supply.

7. The air supply system of claim **6**, said quick disconnect fitting port defining an open head space between a distal end of said quick disconnect fitting and an internal wall of said quick disconnect fitting port, and said quick disconnect fitting port further comprising an air outlet in fluid communication with an air inlet of said first stage regulator chamber.

8. The air supply system of claim **7**, further comprising an air inlet in said quick disconnect fitting port positioned to allow airflow between said head space and said on/off valve.

9. The air supply system of claim **7**, further comprising an auxiliary gauge port extending from said head space and defining an opening through a top surface of said one-piece manifold body, wherein said opening through the top surface of said one-piece manifold body is configured to removably receive an auxiliary data gauge.

10. The air supply system of claim **6**, wherein said quick disconnect fitting extends upward from a top surface of said one-piece manifold body and toward the back side of said one-piece manifold body.

11. The air supply system of claim **1**, further comprising a high pressure relief valve in fluid communication with said air channel.

12. The air supply system of claim **11**, wherein said high pressure relief valve extends vertically downward from the bottom side of said one-piece manifold body.

13. The air supply system of claim **1**, wherein said air channel extends horizontally through said manifold body at a normal angle to said first stage regulator chamber, and wherein said at least one bottle port extends vertically away from said air channel.

14. An air supply system, comprising:

a one-piece manifold body having a top side, a bottom side opposite said top side, a front side extending between said top side and said bottom side, and a back side opposite said front side, said one-piece manifold body further comprising:

a plurality of bottle ports on said top side of said manifold body;

a first stage regulator chamber extending through said manifold body from said front side to said back side;

an air channel in fluid communication with said bottle ports and said first stage regulator chamber;

an outlet channel in fluid communication with said first stage regulator chamber; and

a quick disconnect fitting port positioned between said bottle ports;

a first stage regulator further comprising a diaphragm and a valve positioned within said first stage regulator chamber, wherein said first stage regulator extends horizontally through said first stage regulator chamber between the plurality of bottle ports from the front side of said manifold body to the back side of said manifold body;

a mask hose attachment in fluid communication with said outlet channel; and

an on/off valve operatively engaging said air channel to regulate air flow between said at least one bottle port and said first stage regulator.

15. The air supply system of claim **14**, wherein said on/off valve extends outward from said one-piece manifold body from a bottom side of said one-piece manifold body.

16. The air supply system of claim **15**, wherein said on/off valve extends angularly outward from said one-piece manifold body at a non-vertical angle.

17. The air supply system of claim **14**, further comprising a quick disconnect fitting removably mounted in said quick disconnect fitting port and configured for connection to an air supply.

18. The air supply system of claim **17**, said quick disconnect fitting port further defining an open head space between a distal end of said quick disconnect fitting and an internal wall of said quick disconnect fitting port, and said quick disconnect fitting port further comprising an air outlet in fluid communication with an air inlet of said first stage regulator chamber.

19. The air supply system of claim **18**, further comprising an air inlet in said quick disconnect fitting port positioned to allow airflow between said head space and said on/off valve.

20. The air supply system of claim **18**, further comprising an auxiliary gauge port extending from said head space and defining an opening through a top surface of said one-piece manifold body, wherein said opening through the top surface of said one-piece manifold body is configured to removably receive an auxiliary data gauge.

21. The air supply system of claim **17**, wherein said quick disconnect fitting extends upward from a top surface of said one-piece manifold body and toward the back side of said one-piece manifold body.

22. The air supply system of claim **14**, further comprising a high pressure relief valve in fluid communication with said air channel.

23. The air supply system of claim **22**, wherein said high pressure relief valve extends vertically downward from the bottom side of said one-piece manifold body.

24. The air supply system of claim **14**, wherein said air channel extends horizontally through said manifold body at a normal angle to said first stage regulator chamber, and wherein said at least one bottle port extends vertically away from said air channel.

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